III. REMARKS

The specification has been amended to include character reference "14" shown in original Figure 6.

Claims 2 and 5 have been cancelled without prejudice. Claims 1, 3, 4 and 6-8 have been amended, and new claims 10-23 have been added. More specifically, independent claim 1 has been amended to incorporate the subject matter of original claim 2 and to additionally recite "in the cutting point deciding step (B), as for arrangement of each intersection point, data concerning the rotational operation and data concerning the identical pattern are stored in a storage device" as supported on page 1, lines 8-9, and on page 4, lines 12-21, of Applicants' specification as originally filed. Claim 1 has also been amended to recite "step (F) of outputting the cell inner shape data to a display" as supported by Figure 6 and Figures 19a to 19d, and on page 15, lines 15-17, and on page 19, line 27, to page 20, line 6, of the above-captioned application as originally filed. Claims 3 and 4 have been amended to depend upon claim 1, which has no further limiting effect on the scope of claims 3 and 4.

Independent claim 8 has been amended to incorporate the subject matter of original claim 2 and to additionally recite "in the cutting point deciding step (B), as for arrangement of each intersection point, data concerning the rotational operation and data concerning the identical pattern are stored in a storage device" as supported on page 1, lines 8-9, and on page 4, lines 12-21, of Applicants' specification as originally filed. Claim 8 has also been amended to recite "step (F) of outputting the cell inner shape data to a display" as supported by Figure 6 and Figures 19a to 19d, and on page 15, lines 15-17, and on page 19, line 27, to page 20, line 6, of the above-captioned application as originally filed. The preamble of claim 8 has been amended to recite "wherein the program is stored on a computer readable medium and causes a computer to execute..." as supported on page 1, lines 5-11, and on page 2, lines 10-15, and on page 28, lines 18-19, of Applicants' specification as originally filed.

New independent claim 10 corresponds to the subject matter of present independent claim 1, but rewritten without the "step-plus-function" language that invokes 35 U.S.C. § 112, sixth paragraph. Therefore, new independent clam 10 is broader in scope than independent claim 1. Likewise, new independent claim 11 corresponds to the subject matter of present independent claim 8, but rewritten without the "step-plus-function" language that invokes 35 U.S.C. § 112, sixth paragraph. Therefore, new independent clam 11 is broader in scope than independent claim 8.

New independent claim 12 incorporates subject matter from original claims 1 and 5, and further recites "in the cutting point deciding step (B), as for arrangement of each intersection point, data concerning the rotational operation and mirroring operation and data concerning the identical pattern are stored in a storage device" as supported on page 1, lines 8-9, and on page 4, lines 12-21, of Applicants' specification as originally filed. New claim 12 also recites "step (F) of outputting the cell inner shape data to a display" as supported by Figure 6 and Figures 19a to 19d, and on page 15, lines 15-17, and on page 19, line 27, to page 20, line 6, of the above-captioned application as originally filed. New independent claim 13 corresponds to the subject matter of new claim 12, but rewritten without the "step-plus-function" language that invokes 35 U.S.C. § 112, sixth paragraph. Therefore, new independent clam 13 is broader in scope than independent claim 12. Claims 6 and 7 have been amended to depend upon new claim 12, which has no further limiting effect on the scope of claims 6 and 7.

New independent claim 14 incorporates subject matter from original claims 8 and 5, and further recite "in the cutting point deciding step (B), as for arrangement of each intersection point, data concerning the rotational operation and mirroring operation and data concerning the identical pattern are stored in a storage device" as supported on page 1, lines 8-9, and on page 4, lines 12-21, of Applicants' specification as originally filed. New claim

14 also recites "step (F) of outputting the cell inner shape data to a display" as supported by Figure 6 and Figures 19a to 19d, and on page 15, lines 15-17, and on page 19, line 27, to page 20, line 6, of the above-captioned application as originally filed. New independent claim 15 corresponds to the subject matter of new claim 14, but rewritten without the "step-plus-function" language that invokes 35 U.S.C. § 112, sixth paragraph. Therefore, new independent clam 15 is broader in scope than independent claim 14.

New claims 16-23 depend, respectively, on independent claims 1, 8 and 10-15 and additionally recite "showing images on the display using the cell inner shape data" as supported by Figures 19a to 19b, and on page 15, lines 15-17, of the original application as filed.

The present amendment adds no new matter to the above-captioned application.

A. The Invention

The invention pertains broadly to a method and program for converting boundary data into cell inner shape data, such as is used for the purposes of computer aided design (CAD), computer aided manufacturing (CAM), computer aided engineering (CAE), computer aided testing (CAT), and the like, when used as simulation means for designing, fabricating, analyzing and testing. In accordance with one method embodiment of the present invention, a method for converting boundary data into cell inner shape data is provided that includes the steps recited by independent claim 1. In accordance with another method embodiment of the present invention, a method for converting boundary data into cell inner shape data is provided that includes the steps recited by independent claim 10. In accordance with yet another method embodiment of the present invention, a method for converting boundary data into cell inner shape data is provided that includes the steps recited by independent claim 12. In accordance with still another method embodiment of the present invention, a method for

converting boundary data into cell inner shape data is provided that includes the steps recited by independent claim 13.

In accordance with a program embodiment of the present invention, a program for converting boundary data into cell shape data is provided that causes a computer to execute the steps recited by independent claim 8. In accordance with another program embodiment of the present invention, a program for converting boundary data into cell shape data is provided that causes a computer to execute the steps recited by independent claim 11. In accordance with yet another program embodiment of the present invention, a program for converting boundary data into cell shape data is provided that causes a computer to execute the steps recited by independent claim 14. In accordance with still another program embodiment of the present invention, a program for converting boundary data into cell shape data is provided that causes a computer to execute the steps recited by independent claim 15. Various other method and program embodiments, in accordance with the present invention, are recited by the dependent claims.

The various embodiments, in accordance with the present invention, have the advantage that cell inner shape data is utilized in a manner that makes it possible to store external data of an object as a cell hierarchy in which the external cell is divided into cells in an orthogonal grid using only a small storage capacity.

B. The Rejections

Claims 1-9 stand rejected under 35 U.S.C. § 101 for failing to recite statutory subject matter.

Claims 1-3 and 8 stand rejected under 35 U.S.C. § 102(b) as anticipated by Ake Wallin (Ake Wallin, "*Constructing Isosurfaces from CT data*," IEEE COMPUTER GRAPHICS & APPLICATIONS 28, 28-33 (1991), hereafter, the "Wallin Article").

Applicants respectfully traverse the Examiner's rejection and request reconsideration of the above-captioned application for the following reasons.

C. Applicants' Arguments

As an initial matter, Applicants' point out that no rejection based on art presently stands against claims 4-7.

i. The Section 101 Rejection

In view of the present amendment, claims 1, 3, 4 and 6-23 now recite statutory subject matter in compliance with 35 U.S.C. § 101. Specifically, independent claims 1, 8 and 10-15 each recite "outputting the cell inner shape data to a display" which is a "useful, concrete and tangible result." See State Street Bank & Trust v. Signature Financial Corp., 47 U.S.P.Q.2d 1596, 1601 (Fed. Cir. 1998). New claims 16-23 also recite a "useful, concrete and tangible result," namely, "showing images on the display using the cell inner shape data."

With respect to independent claims 8, 11, 14 and 15, these claims now also recite "the program is stored on a computer readable medium and causes a computer to execute" the steps of a method. Therefore, claims 8, 11, 14 and 15 recite a "computer readable medium" on which the "program" is stored so these claims are in compliance with Section 101.

For all of the above reasons, claims 1, 3, 4 and 6-23 now recite statutory subject matter in compliance with 35 U.S.C. § 101.

ii. The Section 102 Rejection

Anticipation under 35 U.S.C. § 102 requires showing the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim. Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick, 221 U.S.P.Q. 481,

485 (Fed. Cir. 1984). In this case, the Examiner has not established a prima facie case of anticipation against Applicants' claims because the Wallin Article fails to teach each and every element of the claimed invention.

iii. The Wallin Article

The Wallin Article discloses "constructing isosurfaces from CT data" that involves two phases: (1) edge generation based on the isosurface and cube intersections, and (2) edge connection and polygon generation (Wallin Article, at 29, second col., lines 11-14). The first phase involves, according to Wallin, at 30, first col., lines 1-7, the generation of two lists, namely, (i) the vertices along the borders where the isosurface intersects the cubes, and (ii) the directed edges connecting vertices along the faces. The Wallin Article also discloses that the second phase involves generating three lists, namely, (i) a vertex list used by the polygons describing the surfaces, (ii) a linked list of the separate surfaces in the volume, and (iii) one linked list of polygons for each surface (Wallin Article, at 30, first col., lines 14-20). The Wallin Article also discloses an "edge generation algorithm" and a "polygon generation algorithm" (Wallin Article, at 30, second col., line 11, to 32, second col., line 2).

However, the Wallin Article does not teach, or suggest,

> "wherein the cells are rectangular parallelepiped cells, and
> in...step (B), intersection points of boundary data and cell edges that have totally 2^{12}=4096 arrangement cases are decided as the cell edge cutting points, and the arrangement cases that become equivalence classes by rotational operation and mirroring operation are decided as identical patterns so that the 2^{12}=4096 arrangement cases are further classified into 144 patterns"

as recited by independent claims 12-15. The Wallin Article also does not teach, or suggest, "in...step (B), as for arrangement of each intersection point, data concerning the rotational operation and mirroring operation and data concerning the identical pattern are stored in a storage device" as recited by independent claims 12-15.

The Wallin Article also does not teach, or even suggest, "in...step (B), as for arrangement of each intersection point, data concerning the rotational operation and data concerning the identical pattern are stored in a storage device" as recited in independent claims 1, 8, 10 and 11. The feature of Applicants' invention, wherein "data concerning the rotational operation...and data concerning the identical pattern are stored in a storage device" makes it possible to store cell inner shape data using a small storage capacity. This advantage provided by Applicants' claimed invention cannot be predicted from the subject matter of the Wallin Article.

For all of the above reasons, the Wallin Article cannot anticipate the subject matter of claims 1, 3, 4 and 6-23 of the above-captioned application.

IV. CONCLUSION

For all of the above reasons, claims 1, 3, 4 and 6-23 recite statutory subject matter in accordance with 35 U.S.C. § 101. In addition, the Examiner's Section 102(b) rejection is untenable and must be withdrawn because the Wallin Article does not teach, or even suggest, (1) "in...step (B), as for arrangement of each intersection point, data concerning the rotational operation and data concerning the identical pattern are stored in a storage device" as recited in independent claims 1, 8, 10 and 11, and (2) multiple limitations recited in claims 12-15 including "in...step (B), as for arrangement of each intersection point, data concerning the rotational operation and mirroring operation and data concerning the identical pattern are stored in a storage device."

For all of the above reasons, claims 1, 3, 4 and 6-23 are in condition for allowance and a prompt notice of allowance is earnestly solicited.

Questions are welcomed by the below-signed attorney for Applicants.

Respectfully submitted,

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